

Rural and Urban Disparities in Multiple Intelligence Dimensions and Achievement in Mathematics among Secondary School Students in Guntur District

Mallam Anjali

Department of Education, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

Abstract

Geographic location, including rural and urban residence, is a strong predictor of educational access and cognitive skills in developing countries such as India. The present investigation endeavours to analyze that, whether, there is any significant difference between Rural and Urban school students in Guntur district, Andhra Pradesh in MI on all the nine dimensions and AM through quantitative and qualitative-categorical analyses. Stratified random sampling was used to select 1,000 Class IX students — 500 Rural and 500 Urban — from 25 schools. Statistical techniques such as Independent Samples t-test and Chi-square (χ^2) were used. Results showed that Urban students were significantly better on MI as a whole ($t = 2.71, p < 0.01$), and also significantly better on seven out of nine intelligence dimensions. Nevertheless, Chi-square analysis shows that there is no statistically significant difference in the distribution of MI level category ($\chi^2 = 5.560, NS$) and in the distribution of MA level ($\chi^2 = 0.427, NS$), serving a disaggregated qualitative and quantitative comparative overview with explicit policy relevance.

Keywords: Multiple Intelligence, Mathematics Achievement, Rural Schools, Urban Schools, Secondary Students, Gardner's Theory, t-test, Chi-square, Andhra Pradesh, Guntur District

1. Introduction

Geographical location continues to be a strong structural predictor of educational quality and student outcomes in India. In Andhra Pradesh, rural and urban secondary school students are exposed to two unalterably different learning environments — rural schools generally contend with lack of infrastructure, teacher vacancies, and limited exposure to extracurricular activities, whereas urban schools enjoy superior infrastructure, instruction in English-medium schools, and greater cognitive stimulation (Government of Andhra Pradesh, Annual School Education Report, 2023–24). The Class IX enrollment in the Guntur district alone was 80,742 students in 2023–24 to be specific and the students are scattered in between rural mandals and urban municipalities, with rural students making up the bulk of government school enrollment (DISE Flash Statistics, Andhra Pradesh, 2022–23). The theory of Multiple Intelligences by Gardner (1983) draws attention to nine varied intelligences — Linguistic, Logical-Mathematical, Spatial, Bodily-Kinesthetic, Musical, Interpersonal, Intrapersonal,

Published: 21 May 2026

DOI: <https://doi.org/10.70558/IJSSR.2026.v3.i3.301097>

Copyright © 2026 The Author(s). This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

Naturalistic, and Existential — each variably shaped by environmental exposure and stimulation. Secondary mathematics performance remains a high-stakes result that informs subsequent academic and vocational options.

2. Background of the Study

Studies on rural-urban students intelligence and mathematics achievement have shown inconsistent results in India. Asha (2007) found perceived MI differences in rural and urban students and concluded that urban students were superior in verbal-linguistic, logical-mathematical, visual-spatial and intrapersonal intelligences which was due to various environmental factors. Naturalistic Intelligence was also found to be the predominant MI factor by Naval Geeta (2017) as rural students were more exposed to nature. On the mathematics front, Mondal et al. (2013) and Raju (2013) reported poor performance of rural students in mathematics, whereas Awodun and Oyeniya (2018), Singh and Praveen (2010) and Bhairab Datt Pandey (2017) reported insignificant outcome of locality on mathematics score and partly related convergence to common curriculum patterns and equalizing effect of access to information technology. Importantly, prior research All the prior work studies overall MI means (Wang et al., 2006) without considering simultaneously all nine intelligence dimensions examined in this study for rural and urban sub-groups. Additionally, no study at the regional level uses t-test and Chi-square analysis to explore mean-level and categorical-distributional differences simultaneously which is a significant methodological limitation. This paper contributes towards addressing the gap by considering dimension wise t-test in all nine elements of MI using χ^2 test for classification of MI and Mathematics Achievement level classification providing a layered quantitative-qualitative comparison of rural education gaps in Guntur district, Andhra Pradesh.

3. Statement of the Problem and Need for the Study

The present investigation is entitled "A Study of Rural and Urban Schools: MI and Achievement in Mathematics among Secondary School Students". Even though it has been well established that rural-urban differences have significant impact on educational outcomes, none of the studies have focused on all nine Intelligences in rural and urban students at secondary level in the context of Andhra Pradesh. As there were 80742 Class IX students from various localities in Guntur district in 2023-24, knowing whether locality has an impact on some or all specific MI dimensions - and if these variations result in location-based specific MI and mathematics achievement profiles - is important for policy planning. This research bridges that gap by utilizing a two-fold approach combining t-test for the nine MI dimensions and Chi-square for both MI and Mathematics, which yields both quantitative magnitude and qualitative distribution based view for the holistic application in the evidence based planning of educational.

4. Review of literature:

Studies on MI and academic achievement provide conflicting results when it comes to rural-urban comparison. Minimal gender difference was observed in MI but the students from urban area were superior in their Logical-Mathematical, Spatial and Intrapersonal intelligence which was attributed to better environmental exposure (Asha, 2007). Rural students finding a

nature based learning approach were most significant in the Naturalistic Intelligence (Naval Geeta 2017). Awodun and Oyeniyi (2018) and Bhairab Datt Pandey (2017) found no statistically significant differences when comparing rural and urban students' performance in mathematics and attributed this finding to standardized curricula. Yet, Mondal et al. (2013) documented rural underachievement in the face of infrastructural and pedagogical constraints, suggesting that regional differences remain.

5. Objectives of the Study

1. To Assess Comparison of all the Nine Dimensions of Multiple Intelligence among Rural and Urban Secondary School Students of Guntur district Andhra Pradesh, by applying t-test.
2. To analyze Rural and Urban variation in MI type classification and Mathematics Achievement levels through Chi-square qualitative-categorical analysis between secondary students.

6. Research Methodology

Research Design: Normative Survey Method. Population: 80,742 students of Class IX in Guntur district, Andhra Pradesh (2023–24). Sample: 1000 students of Class IX were selected by Stratified Random Sampling from 25 schools – 500 from Rural and 500 from Urban.

Instruments

The MI Scale (Agarwal & Pal, 2018) was employed. The MI Scale by Agarwal and Pal (2018) was utilized. The instrument consists of 90 items (10 items for 8 types of intelligences) in the form of the 5-point likert scale (Always=5, Mostly=4, Often=3, Rarely=2, Never=1). All the dimensions attained reliability coefficients in the range of 0.71 to 0.89. Content Validity was established through expert panel review and Construct Validity through factor analysis. Mathematics Achievement Test (MAT): Students' mathematics achievement was measured by their marks on the Class IX final exam (maximum obtainable score: 100). These tests are national and test overall mathematical abilities in basic number operations, algebraic thinking, geometry, and problem solving.

7. RESULTS

Table 1: Multiple Intelligence of Rural and Urban School Students (Overall t-test)

Locality	N	Mean	SD	% of Mean	S.Ed	t-value
Rural	500	292.63	28.11	65.03	1.74	2.71**
Urban	500	297.35	28.20	66.08	—	—

** Significant at 0.01 level (Source: Primary Data)

The rural students' mean MI was 292.63 (SD = 28.11, % mean = 65.03), while the urban students' was 297.35 (SD = 28.20, % mean = 66.08). The S.Ed was 1.74. The calculated t = 2.71 is greater than the critical value 2.56 at df = 998, 0.01 level, indicating that there is a significant difference in favour of Urban students in total Multiple Intelligence. At variance

with the Government–Private analysis across the whole study, in the mean-level MI comparison, locality qualifies as a true delimitator. The increased opportunities among urban students to encounter varied experiences, technology, extracurricular endeavors, and abundant resources may account for their much higher MI scores than those of their rural rivals.

Table 2: Dimension-wise Multiple Intelligence of Rural and Urban School Students (t-test)

Dimension	Rural Mean	Rural SD	Rural %	Urban Mean	Urban SD	Urban %	S.Ed	t-value	Sig
Linguistic	31.61	3.39	63.22	32.63	3.23	65.26	0.209	4.880	**
Logical	31.64	3.00	63.28	32.74	2.84	65.48	0.185	5.946	**
Bodily-Kinesthetic	33.05	3.27	66.10	33.59	3.11	67.18	0.201	2.673	**
Spatial	33.78	2.96	67.56	34.70	2.80	69.40	0.182	5.055	**
Musical	33.97	3.20	67.94	34.41	3.04	68.82	0.197	2.234	*
Naturalistic	36.72	2.91	73.44	35.60	2.75	71.20	0.179	-6.257	**
Interpersonal	31.86	3.51	63.72	32.54	3.35	65.08	0.217	3.134	**
Intrapersonal	30.01	3.40	60.02	30.83	3.24	61.66	0.210	3.905	**
Existential	29.99	3.26	59.98	30.31	3.10	60.62	0.200	1.592	NS

** Significant at 0.01 level; * Significant at 0.05 level; NS – Not Significant (*Source: Primary Data*)

Dimension-wise t-tests reveal that Urban participants scored higher in seven of nine dimensions: Linguistic ($t = 4.880^{**}$), Logical ($t = 5.946^{**}$), Bodily-Kinesthetic ($t = 2.673^{**}$), Spatial ($t = 5.055^{**}$), Interpersonal ($t = 3.134^{**}$), Intrapersonal ($t = 3.905^{**}$), and Musical ($t = 2.234^{*}$). More important, Rural participants obtained significantly higher scores in Naturalistic Intelligence ($t = -6.257^{**}$), due to their hands-on work with the natural world each day. There was no significant difference for Existential Intelligence ($t = 1.592$, NS). Urban advantages are also most pronounced in the Logical, Spatial, and Linguistic dimensions intelligences that are least amenable to informal exposure and that are thought to be most directly fostered by formal schooling in English-medium environments. This per-dimension analysis reveals locality effects in a much more fine-grained way than what can be inferred from general MI means.

Table 3: Classification of Rural and Urban Students by MI Levels (Chi-square)

Locality	Low MI (<278)	Average MI (278–327)	High MI (≥328)	Total	χ^2 value
----------	---------------	----------------------	----------------	-------	----------------

Rural	151 (137.0)	294 (299.0)	55 (64.0)	500	5.560 NS
Urban	123 (137.0)	304 (299.0)	73 (64.0)	500	
Total	274	598	128	1000	

df = 2; Critical value = 5.991 (0.05 level); 9.210 (0.01 level); NS – Not Significant (*Source: Primary Data*)

The chi-square statistic, with expected frequencies in parentheses, was used. MI level ranges were constructed from the norms for classification of the thesis: Low (<278), Average (278–327), High (≥328). The calculated $\chi^2 = 5.560$ is less than the critical value 5.991 at df = 2, 0.05 level. Although there is a significant mean MI difference in Table 1 between Rural and Urban, the categorical proportions at MI levels are not significantly different for these two groups. This is a methodologically rich result: locality shifts the mean up for Urban students, but does not generate a categorically distinct MI profile at the distributional level. Rural and Urban students are roughly proportionate within the Low, Average and High MI groups, indicating that mean and categorical analyses of scores are sensitive to different aspects of the rural-urban relationship for MI.

Table 4: Classification of Rural and Urban Students by Mathematics Achievement Levels (Chi-square)

Locality	Low (<50)	Average (50–70)	High (>70)	Total	χ^2 value
Rural	74 (70.5)	385 (387.5)	41 (42.0)	500	0.427 NS
Urban	67 (70.5)	390 (387.5)	43 (42.0)	500	
Total	141	775	84	1000	

df = 2; Critical value = 5.991 (0.05 level); NS – Not Significant (*Source: Primary Data*)

Chi-square (χ^2) was computed for mathematics achievement level ranges formed based on the Class IX Summative Assessment scores. Rural students: Low = 74 (fe = 70.5), Average = 385 (fe = 387.5), High = 41 (fe = 42.0); Urban students: Low = 67, Average = 390, High = 43. The calculated $\chi^2 = 0.427$ is well below the critical value 5.991 for df = 2 at 0.05 level. There is no statistically significant difference in the proportion of student’s achievement level in mathematics between Rural and Urban students. Almost all students in each group 385 Rural and 390 Urban students belong to Average level of achievement (50–70 marks). This finding, which is consistent with the t-test result of t = 0.714, NS, verifies conclusively that locality is not a factor that affects mathematics achievement at neither the mean nor the categorical distributional level and this provides a two-fold quantitative-qualitative corroboration.

8. Conclusion

This research demonstrates that Urban students tend to score significantly higher on overall MI and on seven of the nine intelligence dimensions but that this average advantage does not result in Urban students and Rural students having categorically different distributions of MI

levels – Urban and Rural students are evenly matched in terms of Low, Average, and High MI categories. For Mathematics Achievement the t-test and Chi-square tests unequivocally demonstrate no significant rural-urban difference with 77.5% of all students within each locality falling within the category of Average achievement. The dimension-wise analysis provides a unique result which is that Rural students have a significantly higher Naturalistic Intelligence ($t = -6.257$, $p < 0.01$), which has a direct pedagogical implication. Taken together, these results indicate that educational policy in Andhra Pradesh should shift its focus from institutional-type debates to place-based, dimension-specific MI interventions that are particularly geared at enhancing the development of Linguistic, Logical-Mathematical and Spatial intelligences among rural children while capitalising on the unique Naturalistic Intelligence superiority that rural children innately enjoy for contextualised mathematics instruction.

9. Major Findings

1. The mean overall MI was significantly higher for Urban students (297.35) than for the Rural (292.63) validated through t-test ($t = 2.71$, $p < 0.01$, $df = 998$, 0.01 level).
2. Urban students were also found to be significantly better than Rural students in Linguistic ($t = 4.880^{**}$), Logical ($t = 5.946^{**}$), Spatial ($t = 5.055^{**}$), and Intrapersonal ($t = 3.905^{**}$) intelligences.
3. We found a broad urban MI advantage as Urban students also scored significantly higher for Bodily-Kinesthetic ($t = 2.673^{**}$), Interpersonal ($t = 3.134^{**}$), and Musical ($t = 2.234^{*}$) intelligence.
4. Naturalistic Intelligence was found to be significantly higher for the Rural students (36.72) in compared to the Urban students (35.60) in t-test ($t = -6.257$, $p < 0.01$), reflecting the rural environmental advantage.
5. Existential Intelligence did not differ significantly between rural and urban ($t = 1.592$, NS), indicating that philosophical-spiritual intelligence is not influenced by place.
6. However, χ^2 revealed no significant difference in the distribution of MI level categories (High, Average and Low MI) to Rural and Urban students in spite of significant mean MI difference between them ($\chi^2 = 5.560$, NS, $df = 2$, 0.05 level).
7. Comparison of Mathematics Achievement mean of Rural students (58.60) and that of Urban students (58.95) did not show significant t-test difference ($t = 0.714$, NS), (confirmed by Chi-square test: $\chi^2 = 0.427$, NS, $df = 2$).

10. Policy Implications and Suggestions

The Government of Andhra Pradesh needs to address such dimension-specific MI gaps between rural and urban secondary students as identified through t-test analysis by prioritising investment in rural secondary schools to provide digital laboratories, English-language enrichment programmes, and spatially stimulating learning materials in order to compensate for the fact that Urban students are far ahead of Rural students in Logical, Linguistic, and Spatial intelligence dimensions.

In view of the fact that Naturalistic Intelligence is strongly in favour of Rural students ($t = -6.257, p < 0.01$), the School Education Department of Andhra Pradesh should work out context-based mathematics syllabi for rural schools using environmental and nature-based problem-solving strategies and turn rural students' Naturalistic forte into a scaffold for mathematical thinking and performance.

In view of Chi-square reporting no significant difference between rural and urban at either the two MI level distribution or Mathematics Achievement levels of categories, it is recommended that academic monitoring at the district level in Guntur should now shift to dimension-specific MI profiling rather than resemble location-reliant intervention, this way teachers in both rural and urban schools are capacitated to teach mathematics in ways that is targeted and responsive to (one/dimensions of) intelligence.

References:

- [1] Asha, B. (2007). *Multiple intelligences among secondary school students: A comparative study of rural and urban schools*. Unpublished doctoral dissertation, University of Mysore.
- [2] Awodun, A. O., & Oyeniyi, A. D. (2018). Influence of school location on students' academic achievement in mathematics at the secondary school level. *International Journal of Scientific Research in Education*, 11(2), 342–350.
- [3] Anjali, M., & Srinivas, K. V. R. (2025). GEOPOLITICS: STATUS OF PRIMARY AND SECONDARY SCHOOL EDUCATION IN ANDHRA PRADESH: DURING 2013-2023. *EPRA International Journal of Research & Development (IJRD)*, 10(12), 229–240. DOI:[10.36713/epra2016](https://doi.org/10.36713/epra2016)
- [4] Anjali, M., & Srinivas, K. V. R. (2025). Implementation Of Right To Education - Act Provisions In Guntur Dist- A Study Based On Primary Data In Andhra Pradesh. *International Journal of Creative Research Thoughts (IJCRT)*, 13(11), 88–99. DOI: [10.56975/ijcrt.v13i11.297819](https://doi.org/10.56975/ijcrt.v13i11.297819)
- [5] Fatimah, S., Budiharti, R., & Ekawati, E. Y. (2020). The relationship between multiple intelligences and mathematical problem-solving ability of junior high school students. *Journal of Physics: Conference Series*, 1567, 022061. <https://doi.org/10.1088/1742-6596/1567/2/022061>
- [6] Gardner, H. (2006). *Multiple intelligences: New horizons in theory and practice*.
- [7] Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*.
- [8] Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. Basic Books.
- [9] Geeta, N. (2017). Multiple intelligences of secondary school students: A study of rural and urban differences. *Journal of Educational Psychology and Research*, 9(4), 201–208.

- [10] Kandeel, R. A. (2016). Multiple intelligences patterns and their relationship with mathematics achievement and attitudes among Saudi university students. *European Journal of Science and Mathematics Education*, 4(1), 92-103.
- [11] Kingdon, G. G. (2020). The private schooling phenomenon in India: A review. *Journal of Development Studies*, 56(10), 1795-1817. <https://doi.org/10.1080/00220388.2019.1623288>
- [12] Malaran, P. D. (2024). Multiple intelligences and academic performance of senior high school students. *International Journal of Multidisciplinary Research and Analysis*, 7(1), 256-268.
- [13] Mallam, A., & Suneela, M. E. (2025). Achievement in mathematics of secondary school students. *International Journal of Creative Research Thoughts*, 13(5), q659–q664. <https://doi.org/10.56975/ijert.v13i5.288315>
- [14] Mallam, A., & Suneela, M. E. (2025). Multiple intelligence of secondary school students. *International Journal of Research and Analytical Reviews*, 12(2), 114–119. <https://doi.org/10.56975/ijrar.v12i2.315186>
- [15] Mondal, B., Mete, J., & Nath, A. (2013). Disparities in mathematics achievement at the secondary level: Rural versus urban perspectives. *Journal of Educational Planning and Administration*, 27(3), 289–301.
- [16] Pandey, B. D. (2017). Academic proficiency and school location: A study of secondary school students. *Indian Educational Review*, 53(2), 88–95.
- [17] Talluri, S. (2019). Self-efficacy of secondary school students in relation to the academic achievement. *Research Journal of Humanities and Social Sciences*, 10(4), 1066–1068. <https://doi.org/10.5958/2321-5828.2019.00174.8>